We study the amount of sterilising vaccination required to prevent the spread of a highly contagious online meme (basi
Introduction Controlling contagion processes—biological or informational—on complex networks is a central problem in
We pursue two complementary goals: (i) derive the minimal vaccination coverage under random and degree-10-targeted
Methodology Network construction Let P_k denote the pre-intervention degree distribution and assume no degree–degre

yields $a \approx 0.0702$ and $\lambda \approx 2.471$. A configuration-model network with $N = 10^4$ nodes was generated using `networkx`. After
Epidemic model We employ an SIR process with per-contact transmission rate β and recovery rate $\gamma = 1$ (time unit: o
Vaccination scenarios Four scenarios were analysed:

Baseline (no vaccination).
Random vaccination at $v = 75\%$. Nodes are removed uniformly at random.
Degree-10 targeting (all). Every node of degree 10 is vaccinated, $v = a = 7.02\%$.
Degree-10 targeting (partial). Only $v = 8\%$ of the overall population is vaccinated by selecting a random subset of degr
Each initial condition seeds 5 infections outside the vaccinated set. Simulations were performed with `fastGEMF` for $T = 100$
Analytical Results Random vaccination Removing a random fraction v of nodes rescales the excess degree by $q' = (1 -$

Hence vaccinating 75% of nodes suffices.
Targeted vaccination of degree k Let $P_{10} = a$ and vaccinate a fraction x among degree-10 nodes only. Post-intervention

Setting $q' = (m_2' - m_1')/m_1' = 1$ and solving for x yields

A necessary feasibility condition is $x_c \leq 1$, which translates to $a \geq 9/80 \approx 0.1125$ (11.25). Because our network has $a = 7.02$

Simulation Results Figure compares compartment trajectories; Table summarises key metrics. [http] [width=0.45]resul

Discussion Our joint analytical–simulation approach elucidates how network heterogeneity interacts with targeted inter
Limitations include the synthetic nature of the network and the assumption of perfect vaccine efficacy and no behaviou
Conclusion For a meme with basic reproduction number 4 on a network with mean degree 3 and excess degree 4, rando
*References 99

R. Kuehn and T. Rogers, “Heterogeneous micro-structure of percolation in sparse networks,” *Europhysics Letters*, vol. 118,
C. Hurry, A. Mozeika, and A. Annibale, “Vaccination with partial transmission and social distancing on contact networks,”

Simulation code listings Scripts used for network construction, parameter assignment, and simulation are available as n